Explicit nonstandard finite difference discretisation of FitzHugh-Nagumo equations

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Keywords: FitzHugh-Nagumo; nonstandard finite difference.

In this work, we consider numerical solutions of the FitzHugh-Nagumo reaction diffusion system of equations describing the propagation of electrical signals in nerve axons, [1, 2, 3]. The system consists of two coupled equations: a nonlinear partial differential equation and a linear ordinary differential equation. We begin with a review of the qualitative properties of the system and the sub equations. This is followed by a systematic derivation of three explicit nonstandard finite difference schemes in the limit of fast extinction and slow recovery. A qualitative study of the schemes together with the error analysis is presented. Numerical simulations are given to support the theoretical results and verify the efficiency of the proposed schemes.

References

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